

# Attainment of SJVDP Objectives

Seven years after publication of the 1990 *Plan*, the question is: “Where do we now stand in achieving SJVDP’s objective of protecting those interests affected by drainage problems, namely, agriculture, fish and wildlife, water quality, and public health?”

## Agricultural Sustainability

To sustain productive irrigated agriculture, shallow groundwater must remain below the crop root zone with low concentrations of salt and boron. Shallow groundwater can cause progressive salinization of the crop root zone. Soil salinization has serious adverse impacts on crop productivity; salt balance is essential to maintain healthy irrigated agriculture. Accordingly, the status of shallow groundwater in the Valley is an important indicator of the efficacy of management efforts to maintain productive agriculture.

**Table 10—Surface Water Salt Inflow/Outflow for San Joaquin Valley Subareas in Daily Railroad Cars of Salt (*thousands of metric tons per year*)**

Subarea	SALT INFLOW			SALT OUTFLOW	Net Daily Salt Inflow
	Eastside Rivers	Project Water	Total Inflow	San Joaquin River	
Grasslands	4.4 (145)	16.5 (545)	20.9 (690)	17.1 (565)	3.8 (125)
Westlands	0	12.4 (412)	12.4 (412)	0	12.4 (412)
Tulare	4.4 (147)	2.4 (80)	6.8 (227)	0	6.8 (227)
Kern	5.8 (192)	11.2 (327)	17.0 (564)	0	17.1 (564)
Total	14.6 (484)	42.5 (1409)	57.1 (1893)	17.1 (565)	40.0 (1328)

*Note: One railroad car of salt is equal to 100 U.S. tons or 90.7 metric tons.*

DWR staff estimated salt imports and exports within the west side of the Valley to get some measure of the magnitude of the salt balance problem. DWR’s estimate of net salt inflow into the four SJVDIP planning subareas (Figure 1 and Table 10) from imported water (SWP, CVP, and east side rivers) for WY 1990 was 1.33 million metric

**Table 11—Projected Areas of Root-Zone Impacting Groundwater and Recommended Management Measures for 2000 (*in thousands of acres*)**

	Groundwater Impact		Management Measures					Total
	0-5 feet	0-5 feet	Salt Management			Groundwater Management	Land Retirement	
Subarea	Total	>2,500 ppm TDS or >2 ppm B	Tile Drainage	Drainage Reuse	Evaporation Ponds	<1,250 ppm TDS >200 ft. thick	Class 4 Land >50 ppb Se	
Grasslands	230	116	108	3.5	0.2	5	0	116.7
Westlands	170	108	69	5.9	0.4	15	18.0	108.3
Tulare	359	125	96	8.7	1.2	20	0	125.9
Kern	110	61	53	5.0	0.8	0	3.1	61.9
<b>Total</b>	<b>869</b>	<b>410</b>	<b>326</b>	<b>23.1</b>	<b>2.6</b>	<b>40</b>	<b>21.1</b>	<b>412.8</b>

**Table 12—Projected Areas of Root-Zone Impacting Groundwater and Recommended Management Measures for 2040 (*in thousands of acres*)**

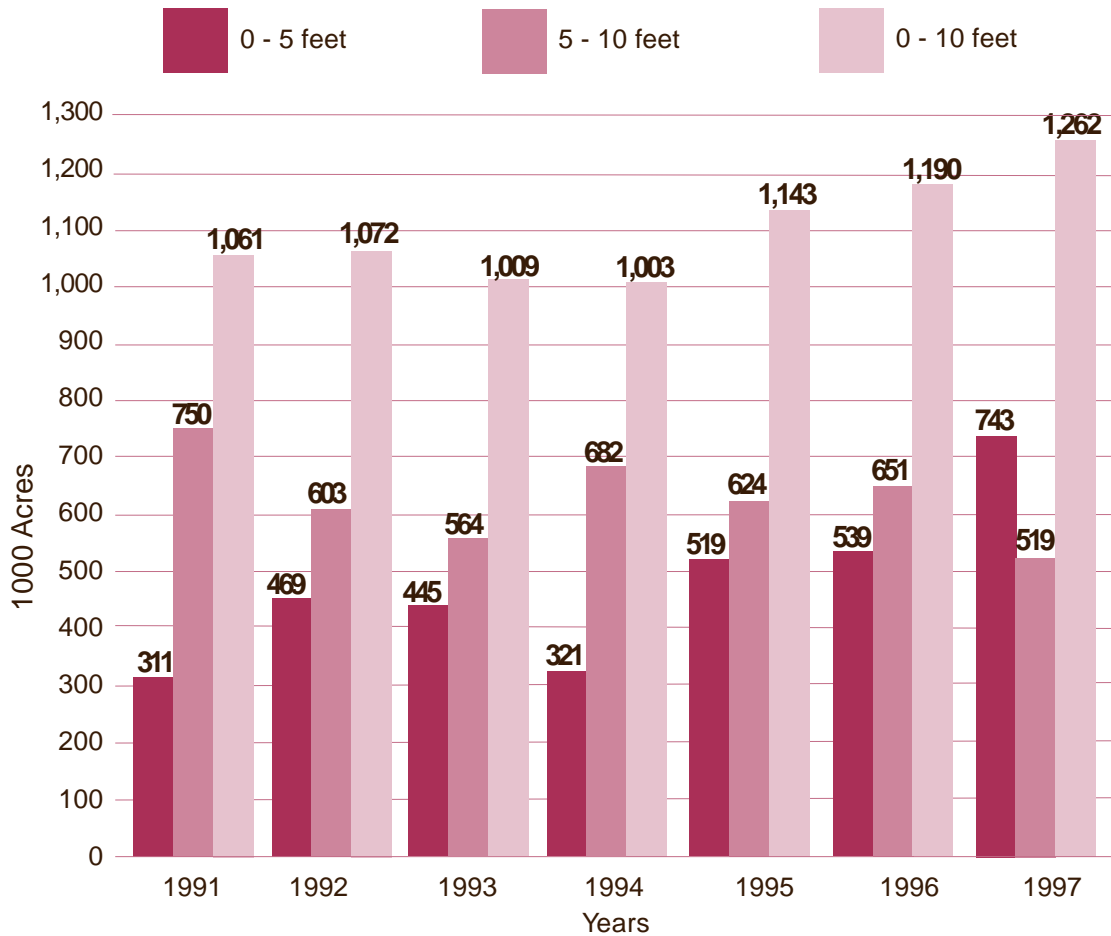
	Groundwater Impact		Management Measures					Total
	0-5 feet	0-5 feet	Salt Management			Groundwater Management	Land Retirement	
Subarea	Total	>2,500 ppm TDS or >2 ppm B	Tile Drainage	Drainage Reuse	Evaporation Ponds	<1,250 ppm TDS >200 ft. thick	Class 4 Land >50 ppb Se	
Grasslands	230	207	192	2.6	0.2	10	3	207.8
Westlands	227	205	140	12.1	2.1	19	33	206.2
Tulare	387	348	277	24.5	3.0	40	7	351.5
Kern	167	150	106	9.7	2.3	0	32	150.0
<b>Total</b>	<b>1,011</b>	<b>910</b>	<b>715</b>	<b>48.9</b>	<b>7.6</b>	<b>69</b>	<b>75</b>	<b>915.5</b>

tons (1.46 million U.S. tons) or the equivalent of 40 railroad cars of salt every day.

Other sources also contribute to salinization of the crop root zone. Salt is imported into the root zone by adding fertilizer and irrigating with local saline groundwater (in addition to imported surface water). Irrigation also weathers minerals and dissolves salts already present in the soil. Agricultural sustainability depends not only on lowering groundwater levels, but also on achieving salt reduction and maintaining salt balance in the crop root zone. If agriculture in the Valley is to be sustainable, short-term progress in reducing groundwater levels in drought years must be matched by long-term reduction in salt accumulation.

Tables 11 and 12 demonstrate the relationship between shallow (0 to 5 feet deep) groundwater projections and recommended management measures in the 1990 *Plan*. Shallow

**Figure 11—Shallow Groundwater Areas**



*Areas of shallow groundwater in Grasslands, Westlands, Tulare, and Kern subareas combined. (Source: DWR data)*

groundwater projections for 2000 and 2040 were based on groundwater data available in 1987. The assumption was made that areas estimated to have groundwater within 20 feet of the surface in 1987 would have groundwater within 5 feet of the surface by 2040, a total of more than 1,000,000 acres. SJVDP estimated that 869,000 acres would have shallow groundwater by 2000, with only about 410,000 acres projected to have groundwater salinity and boron concentrations sufficiently high to limit agriculture. The low-quality, shallow groundwater areas in 2040 were projected to be approximately 90 percent (910,000 acres) of all shallow groundwater areas (1,011,000 acres).

Groundwater monitoring from 1991 to 1994 indicates (Figure 11) that only about 45 percent of the total acreage of predicted shallow groundwater for 2000 had occurred (390,000 out of 869,000 acres predicted; see Table 11). However, the 1994 total acreage with groundwater within 10 feet of the surface is more than 1,000,000. This area is essentially equal to the predicted 5-foot-deep shallow groundwater area in 2040. Between 1995-1997, the areas with a shallow water table within 5 feet have significantly

increased compared to 1991-1994 period. This is also exhibited in areas with a water table within 10 feet. Even though the present observed area with groundwater within 5 feet of the surface is less than projected, the area with groundwater within 5 to 10 feet of the surface may increase more rapidly than predicted. An exceptionally wet winter could quickly result in a substantial increase in the area of shallow groundwater within 5 feet of the surface. The 1990 *Plan* projected that the area of shallow groundwater would increase between 2000 and 2040, despite 1990 *Plan* implementation, from 869,000 to 1, 011,000 acres (Tables 11 and 12).

Management measures in the 1990 *Plan* are specific to groundwater conditions. While source control could generally be applied to all shallow groundwater areas, drainage reuse and evaporation systems (requiring tile drainage), groundwater management (pumping usable groundwater above the Corcoran Clay), and land retirement were alternative methods to be applied to all low-quality, shallow, groundwater areas. The total acreage for these management measures equals the projected acreage of low-quality, shallow, groundwater – within the limits of rounding (see Tables 11 and 12). These additional measures imply that source control alone could not successfully be used to manage low-quality, shallow groundwater. In fact, the area of low-quality, shallow groundwater was predicted to more than double between 2000 and 2040 (increasing from 410,000 to 910,000 acres), even presuming the application of source control. Even though source control reduces drainage or deep percolation volume, other measures must be implemented to manage low-quality groundwater.

The 1990 *Plan* used a flow chart for determining management measures applicable for agricultural land with low-quality, shallow groundwater. Land retirement and groundwater management preceded drainage reuse in option selection where specific criteria were met (land retirement was an option in 5 percent and groundwater management was an option in 10 percent of all low-quality, shallow groundwater acreage by 2000). All other lands with shallow groundwater were to be tile drained. In subareas other than Grasslands, drainage was to be reused sequentially on trees and halophytes (or halophytes alone) and finally discharged into downsized and modified evaporation ponds. In the Grasslands subarea, more than half of the drained acres would discharge into the River; the balance would be reused or discharged to evaporation ponds. Drainage reuse was the recommended measure for 85 percent of low-quality, shallow groundwater areas (351,000 of 410,000 acres to be managed by 2000). Except for discharge to the River in part of the Grasslands subarea, drainage reuse with evaporation ponds was the only recommended management measure that addressed the salt balance issue. The 1990 *Plan* did not address disposal or use of the salt product of evaporation ponds.

A feasible means of implementing groundwater management has not been developed. Pilot drainage reuse projects are ongoing; results are generally encouraging, but drainage reuse has not reached a development stage that would allow implementation on the scale recommended in the 1990 *Plan*. Land retirement has not yet been implemented in the Westlands and Kern subareas at a rate that would achieve 2000 goals.

## **Fish and Wildlife Protection**

The CVPIA provision of water supply for fish and wildlife resulted in a significant allocation of water for wildlife habitat in Grasslands and other subareas. The Grasslands Bypass Channel will eliminate conveying of subsurface drainage water in Salt Slough, part of Mud Slough, and Grasslands channels. Conveying higher quality water will be a significant benefit for Grasslands' wetland habitats. Evaporation pond modification, management, mitigation, and compensation habitat are reducing adverse impacts on aquatic birds using evaporation ponds.

## **Water Quality**

Protecting water quality in the River is a major concern. CVRWQCB has begun efforts to alleviate degrading effects of drainage water on water quality in the River. The water quality control plan for the San Joaquin River Basin was amended to achieve improved water quality conditions (see "Discharge to the San Joaquin River" in Chapter 3).

Implementing 1990 *Plan* recommendations, primarily source control, contributed to some reduction in salt, selenium, and boron loads in drainage water from the Grasslands subarea to the River. However, the new water quality objectives frequently are not met under present conditions. Further measures need to be implemented to meet CVRWQCB's adopted water quality objectives. It is uncertain what measures (such as drainage reuse, drainage water treatment, or land retirement) and costs will ultimately be necessary to attain acceptable water quality.

## **Public Health**

Selenium intake through drinking water was not a serious concern because concentration of selenium in potable water supplies in the Valley has been less than 2 ppb. (EPA standard is 50 ppb.) SJVDP's primary public health concern relating to drainage water was human intake of selenium from consuming fish and wildlife impacted by selenium. This remains a concern. Human health warnings issued by DHS for fish and waterfowl in the Grasslands areas and waterfowl in the Bay-Delta Estuary remain in effect.